CLAIMS:

1. A wafer bonding method, comprising:

selectively depositing a plurality of metallic lines on opposing surfaces of adjacent wafers;

depositing at least a barrier line on an outer edge of opposing surfaces of the adjacent wafers;

selectively aligning the adjacent wafers to form a stack; and

bonding the metallic lines and the barrier line on the surface of one wafer with the metallic lines and the barrier line on the surface of the other wafer to establish electrical connections between active IC devices on adjacent wafers and to form a barrier structure on the outer edge of the adjacent wafers.

2. The wafer bonding method as claimed in claim 1, wherein the metallic lines are Copper (Cu) bonding pads deposited on opposing surfaces of the adjacent wafers to serve as electrical contacts between active IC devices on both the adjacent wafers.

3. The wafer bonding method as claimed in claim 1, wherein the metallic lines are surrounded by a dielectric recess to ensure that the metallic lines deposited on the surface of one wafer are bonded with the metallic lines deposited on the surface of

the other wafer.

4. The wafer bonding method as claimed in claim 1, wherein the bonded wafers includes a plurality of individual die and the barrier structure is formed on the outer edge of the bonded wafers to protect internal die from corrosion, contamination and crack propagation when the bonded wafers are cut into individual die.

5. The wafer bonding method as claimed in claim 4, wherein the barrier structure is a dense grid of connected copper (Cu) lines in a checkerboard pattern erected on the outer edge of usable die.

6. The wafer bonding method as claimed in claim 5, wherein the barrier structure is erected on the outer edge of usable die using an edge reticle.

7. The wafer bonding method as claimed in claim 1, wherein the bonded wafers correspond to a single die and the barrier structure is formed by one or more barrier lines deposited on the outer edge of the bonded die to protect the bonded die from corrosion, contamination and crack propagation.

8. The wafer bonding method as claimed in claim 7, wherein the barrier lines correspond to concentric copper (Cu) guard rings deposited on the perimeter of the bonded die to serve as passivation barriers.

9. A method of forming a three-dimensional (3-D) integrated chip system, comprising:

forming a first wafer including one or more integrated circuit (IC) devices, metallic lines deposited via an interlevel dielectric (ILD) on a surface, and at least one barrier line deposited on an outer edge of the surface; and

forming a second wafer including one or more integrated circuit (IC) devices, metallic lines deposited via an interlevel dielectric (ILD) on a surface, and at least one barrier line deposited on an outer edge of the surface,

wherein the metallic lines and the barrier line deposited on the surface of the second wafer are bonded with the metallic lines and the barrier line deposited on the surface of the first wafer to establish electrical connections between active IC devices on adjacent wafers and to form a barrier structure on the outer edge of the adjacent wafers.

10. The method as claimed in claim 9, wherein the metallic lines include Copper (Cu) bonding pads deposited on opposing surfaces of the adjacent wafers to serve as electrical contacts between active IC devices on both the adjacent wafers.

11. The method as claimed in claim 9, wherein the bonded wafers includes a plurality of individual die and the barrier structure is formed to protect internal die from corrosion, contamination and crack propagation when the bonded wafers are cut into

individual die.

12. The method as claimed in claim 11, wherein the barrier structure is a dense grid of connected copper (Cu) lines in a checkerboard pattern erected on the outer edge of usable die.

13. The method as claimed in claim 12, wherein the barrier structure is erected on the outer edge of usable die using an edge reticle.

14. The method as claimed in claim 9, wherein the bonded wafers correspond to a single die and the barrier structure is formed by one or more barrier lines deposited on the outer edge of the bonded die to protect the bonded die from corrosion, contamination and crack propagation.

15. The method as claimed in claim 14, wherein the barrier lines correspond to concentric copper (Cu) guard rings deposited on the perimeter of the bonded die to serve as passivation barriers.

16. A method of forming a three-dimensional (3-D) integrated chip system, comprising:

forming a first wafer including one or more active integrated circuit (IC) devices;

forming a second wafer including one or more active integrated circuit (IC)

devices;

depositing first metallic lines on opposing surfaces of the first and second wafers at designated locations to serve as wafer bonding pads and to establish electrical connections between active IC devices on the first and second wafers, when the first and second wafers are bonded; and

depositing second metallic lines on an outer edge of opposing surfaces of the first and second wafers to form a barrier structure, when the first and second wafers are bonded.

17. The method as claimed in claim 16, wherein the first metallic lines include a plurality of Copper (Cu) bonding pads deposited on opposing surfaces of the adjacent wafers to serve as electrical contacts between active IC devices on both the adjacent wafers.

18. The method as claimed in claim 16, wherein the second metallic lines include a plurality of Copper (Cu) barrier lines deposited on the outer edge of the adjacent wafers to protect active IC devices from corrosion and contamination.

19. The method as claimed in claim 16, wherein the barrier structure is a dense grid of connected copper (Cu) lines in a checkerboard pattern erected on the outer edge of usable die within bonded wafers.

20. The method as claimed in claim 19, wherein the barrier structure is erected on the outer edge of usable die using an edge reticle.

21. The method as claimed in claim 16, wherein the bonded wafers correspond to a single die and the barrier structure is formed to protect the bonded die from corrosion, contamination and crack propagation.

22. The method as claimed in claim 21, wherein the second metallic lines correspond to concentric copper (Cu) guard rings deposited on the perimeter of the bonded die to serve as passivation barriers.